



012204

22764 U.S. PTO

19270 U.S. PTO

10/762139



012204

## **SCREW WITH A PLURALITY OF SCREWING ANGLES AND MOLD DEVICE FOR FORMING THE SAME**

### **FIELD OF THE INVENTION**

5        The present invention relates to screws, and particular to a screw with a plurality of screwing angles and a mold device for forming the screw.

### **BACKGROUND OF THE INVENTION**

10        The prior art screw has thread with unique orientation. With reference to Fig. 12, an operation about screwing a prior art screw is illustrated. It is illustrated that the screw is screwed into a work piece with a constant orientation. It results that the screw is tightly clamped by the work piece so that the friction force is larger and thus the screwing work is difficult. When the screw is longer, the difficulty in locking the  
15        screw is enhanced.

### **SUMMARY OF THE INVENTION**

20        Accordingly, the primary object of the present invention is to provide a screw with a plurality of screwing angles which comprises a first section having a first thread with a first screwing angle, at least one third section having a second thread with a second screwing angle; and a fifth section having a first thread with a first screwing angle. The second screwing angle is equal or not equal to the first screwing angle. Moreover, screw further comprises a second section connected between the first section and  
25        the third section; the second section having a fourth thread with a fourth

screwing angle; a fourth section connected between the third section and the fifth section; and the fourth section having a third thread with a third screwing angle. A mold device for forming the screw is also included.

The various objects and advantages of the present invention will be more readily understood from the following detailed description when read in conjunction with the appended drawing.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 is a plan schematic view of the screw of the present invention.

10 Fig. 2 is a schematic view showing that the first screwing angle is larger than the second screwing angle according to the present invention.

Fig. 3 is a schematic view showing that the first screwing angle is smaller than the second screwing angle according to the present invention.

15 Fig. 4 is a cross section view showing that a screw is screwed into a work piece according to the present invention.

Fig. 5 is a schematic view showing the curves in the twisting test according to the present invention.

Fig. 6 is a schematic perspective view of the mold device of the present invention.

20 Fig. 7 is a plan schematic view of the mold device of the present invention.

Fig. 8 is a schematic perspective view of a two mold case of the present invention.

25 Fig. 9 is a schematic view showing that the orientation of the first sloped recess is larger than that of the second sloped recess according to

the present invention.

Fig. 10 is a schematic view showing that the orientation of the first sloped recess is smaller than that of the second sloped recess according to the present invention.

5 Fig. 11 is a schematic view showing the curves about the twisting test of the prior art.

Fig. 12 is a schematic cross view about the operation of the prior art screw.

## 10 DETAILED DESCRIPTION OF THE INVENTION

In order that those skilled in the art can further understand the present invention, a description will be described in the following in details. However, these descriptions and the appended drawings are only used to cause those skilled in the art to understand the objects, features, and characteristics of the present invention, but not to be used to confine the scope and spirit of the present invention defined in the appended claims.

The present invention will be described here.

With reference to Figs. 1 to 3, the screw 1 of the present invention includes a first section 51 having a first thread 11 with a first screwing angle  $\theta_1$ , and at least one third section 53 having a second thread 12 with a second screwing angle  $\theta_2$  and a fifth section 55 having a fifth thread 15 with the first screwing angle  $\theta_1$  which the identical to that in the first section 1. Indeed, the fifth thread 15 is identical the first thread 11, namely, they have the same thread pitch and screwing angle. The second screwing angle  $\theta_2$  is not equal to the first screwing angle  $\theta_1$ . Preferably,

the second screwing angle  $\theta_1$  is larger than the first screwing angle  $\theta_1$  or the second screwing angle  $\theta_2$  is smaller than the first screwing angle  $\theta_1$ .

A second section 52 is connected between the first section 51 and the third section 53. The second section 52 has a fourth thread 14 with fourth screwing angle  $\theta_4$ . A fourth section 54 is connected between the third section 53 and the fifth section 55. The fourth section 54 has a third thread 13 with a third screwing angle  $\theta_3$ . The third screwing angle  $\theta_3$  is smaller than the first screwing angle  $\theta_1$  and / or the fourth screwing angle  $\theta_4$  is smaller than the first screwing angle  $\theta_1$ .

10 The thread pitch of the second thread 12 is 150 to 170 % of the thread pitch of the first thread 11, and the thread pitch of the third thread 13 and / or the fourth screwing angle  $\theta_4$  is 67 to 75 % of that of the first thread 11.

The thread pitch of the second thread 12 is 30 to 50 % of the first thread 11; and the thread pitch of the third thread 13 and / or fourth thread 14 is 125 to 135 % of that of the first thread 11.

The third screwing angle  $\theta_3$  is equal or unequal to the fourth screwing angle  $\theta_4$ .

Referring to Figs. 4, the operation of the present invention will be described here. In screwing the screw 1, the fifth section 55 is firstly enters into the work piece, and the fifth thread 15 identical to the first thread 11 serves to cut into a work piece, where indication A in Fig. 4 is a cut screw channel. When the fourth section 54 having the third thread 13 enters into the work piece, the channel A will be enlarged at one side so as to be form an enlarged portion A1 due to the third screwing angle  $\theta_3$  of the third thread 13 different from the first screwing angle  $\theta_1$  as the dashed line

shown in Fig. 4. When the screw 1 enters into the work piece continuously, due to the second screwing angle  $\theta_2$  of the second thread 12, the channel A is further enlarged at another side so as to form another enlarged portion A2. Next, the fourth thread 14 enters into the work  
5 piece. The channel is further enlarged to a proper width as the indication A2 shown in Fig. 4. Thereby, when the first section 51 of the screw with the first thread 11 further enters into the work piece, since the channel is enlarged, the screw can enter into the work piece with less friction. This is especially beneficial for long screws.

10 The test result of the present invention with the prior art screw will be described herein.

The test object: CHIB wood screw.

Specification: Major diameter / depth of the thread / pitch : 4.0 / 50  
/ 1.8

15 Number of test object: 10, the average value is calculated.

Referring to Figs. 5, the test result is illustrated. It is illustrated the larger twisting force of the screw of the present invention is at a point of about 2.0 to 2.5 cm with an average twisting force of 34.2 kg/cm. Then, after the portion of the screw after that point, the twisting force is normal.

20 This means that when a long screw is used, less power is necessary. The required twisting force will not increase due to the increment of length of the screw.

Referring to Figs. 11, it is illustrated that the average value for the prior art screw is 46.1 /kg/cm. The longer the screw, the larger the  
25 twisting force. Thus it is difficult to lock a long screw.

Thereby, it is known from above test result, as comparing with a screw of 5 cm, the present invention can save a force of 25 % than the prior art. The longer the screw, the larger the force to be saved.

With reference to Figs. 6 to 10, the mold for forming the screw 1 of the present invention will be described herein. A mold 2 for forming a screw with a plurality of screw angle comprises a first mold which has a plurality of recesses 61 approximately arranged in parallel. Each recess 61 includes two first sloped recesses 21 for forming the first thread 11 with a first screwing angle  $\theta_1$  and a second sloped recess 22 for forming the second thread 12 with a second screwing angle  $\theta_2$ . The second sloped recess 22 is connected between the two first sloped recesses 21. The orientation of the second sloped recess 22 is different from that of the first sloped recesses 21.

With reference to Figs. 7, 9, and 10, the first mold further includes a third sloped recess 23 connected between one of the first sloped recess 21 and the second sloped recess 22 so as to be an input end and a fourth sloped trench 24 connected between the other one of the first sloped recess 21 and the second sloped recess 22 so as to be as an output end.

The orientations of the third sloped recess 23 and the fourth sloped trench 24 may be identical or different. Preferably, when the orientation first sloped recess 21 is set as a horizontal direction, the absolute value of the slope of the third sloped recess 23 is identical to or different from the slope of the fourth sloped trench 24.

In the present invention, the slope of the orientation of the second sloped recess 22 is larger than that of the first sloped recess 21, as shown

in Fig. 9 or the slope of the orientation of the second sloped recess 22 is smaller than that of the first sloped recess 21, as shown in Fig. 10.

Moreover, the mold further comprises a second mold. The second mold is symmetrical to the first mold, as shown in Fig. 8.

5       The present invention is thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the present invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

10